




## FCC RF Test Report

<b>Test Report Number</b>	GLS-21081944-LC-FCC-RF
<b>FCC ID</b>	2AVTI-INPX5000
<b>Applicant</b>	Inpixon
<b>Applicant Address</b>	2479 E Bayshore Rd, Ste 195, Palo Alto, CA 94303
<b>Product Name</b>	Inpixon 5000
<b>Model (s)</b>	INPX-5000
<b>Date of Receipt</b>	07/23/2021
<b>Date of Test</b>	07/27/2021-10/04/2021
<b>Report Issue Date</b>	10/08/2021
<b>Test Standards</b>	47 CFR Part 15 Subpart F
<b>Test Result</b>	<b>PASS</b>
	<p>Issued by:</p> <p><b>Vista Compliance Laboratories</b>          1261 Puerta Del Sol, San Clemente, CA 92673 USA  <a href="http://www.vista-compliance.com">www.vista-compliance.com</a></p>
 <hr/> <b>Devin Tai (Test Engineer)</b>	 <hr/> <b>David Zhang (Technical Manager)</b>
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### REVISION HISTORY

Report Number	Version	Description	Issued Date
GLS-21081944-LC-FCC-RF	01	Initial report	10/08/2021

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## 1 Test Summary

Test Item	Test Requirement	Test Method	Result
Antenna Requirement	47 CFR Part 15.203	ANSI C63.10: 2013	Pass*
UWB Bandwidth	47 CFR Part 15.503 (a), (d), 15.517 (b)	ANSI C63.10: 2013	Pass*
Radiated Emission below 960MHz	47 CFR Part 15.209	ANSI C63.10: 2013	Pass
Radiated Emission above 960MHz	47 CFR Part 15.517 (c), 15.521 (d)	ANSI C63.10: 2013	Pass
Radiated Emission in GPS Bands	47 CFR Part 15.517 (d)	ANSI C63.10: 2013	Pass*
Peak Emission in a 50MHz Bandwidth	47 CFR Part 15.517 (e), 15.521 (g)	ANSI C63.10: 2013	Pass
Conducted Emission	47 CFR Part 15.207	ANSI C63.10: 2013	Pass*
RF Exposure	47 CFR Part 1.1310	OET Bulletin 65 FCC 447498 D01	Pass

Note: Pass\*:

The purpose of this report is to provide partial testing and result to support the Class II permissive change due to crystal substitution and other non-radio related minor circuitry modification. For the detail, refers to the C2PC request letter. The radiated emission and peak emission in a 50MHz bandwidth are verified and result is presented in this report. For the rest of test items please refer to original report filed under FCC ID: 2AVTI-INPX5000.

## 2 General Information

### 2.1 Applicant

<b>Applicant</b>	Inpixon
<b>Applicant address</b>	2479 E Bayshore Rd, Ste 195, Palo Alto, CA 94303
<b>Manufacturer</b>	Inpixon
<b>Manufacturer Address</b>	2479 E Bayshore Rd, Ste 195, Palo Alto, CA 94303

### 2.2 Product information

<b>Product Name</b>	Inpixon 5000
<b>Product Description</b>	Inpixon 5000
<b>Model Number</b>	INPX-5000
<b>Family Models</b>	N/A
<b>Serial Number</b>	5000-4.04-501590441
<b>Frequency Band</b>	UWB: 3240-4830MHz, 6215-7000MHz
<b>Type of modulation</b>	Pulse Modulation
<b>Equipment Class</b>	UWB
<b>Antenna Information</b>	Ultra-Wideband (UWB) Flex Antenna, P/N: FXUWB20
<b>Clock Frequencies</b>	N/A
<b>Input Power</b>	12VDC, PoE
<b>Power Adapter Manufacturer/Model</b>	EDACPower / EA1024PR 100-240VAC, 1.0A, 50-60Hz
<b>Power Adapter SN</b>	N/A
<b>Hardware version</b>	N/A
<b>Software version</b>	N/A
<b>Simultaneous Transmission</b>	N/A
<b>Additional Info</b>	EMC Emission Class B, DC input port, PoE port

### 2.3 Test standard and method

<b>Test standard</b>	47 CFR Part 15 Subpart F
<b>Test method</b>	ANSI C63.10: 2013

### 3 Test Site Information

<b>Lab performing tests</b>	Vista Laboratories, Inc.
<b>Lab Address</b>	1261 Puerta Del Sol, San Clemente, CA 92673 USA
<b>Phone Number</b>	+1 (949) 393-1123
<b>Website</b>	www.vista-compliance.com

Test Condition	Temperature	Humidity	Atmospheric Pressure
RF Testing	22.9°C	58.6%	996 mbar
Radiated Emission Testing	23.0°C	58.6%	996 mbar

### 4 Modification of EUT / Deviations from Standards

N/A

### 5 Test Configuration and Operation

#### 5.1 EUT Test Configuration

EUT is powered by external 12VDC AC/DC power adapter or through PoE. Python.exe is used to enable EUT radio module to transmit at set channel continuously for testing purpose. For EMC testing, EUT is in normal operational mode.

The following software was used for testing and to monitor EUT performance

Software	Description
EMISoft Vasona	EMC/RF Spurious emission test software used during testing
Python.exe	To set EUT into continuous TX mode under different channel, etc.

## 5.2 Supporting Equipment

Description	Manufacturer	Model #	Serial #
Laptop	Dell	Latitude E6440	FFF4JC2
AC/DC adapter	EDACPOWER	EA1024PR	192203392
PoE adapter	Microsemi	9001GR/SP	C17296238000000485

## 6 Uncertainty of Measurement

Test item	Measurement Uncertainty (dB)
RF Output Power (Conducted)	±1.2 dB
Power Spectral Density	±0.9 dB
Unwanted Emission (conducted)	±2.6 dB
Occupied Channel Bandwidth	±5 %
Radiated Emission (9KHz-30MHz)	±3.5 dB
Radiated Emission (30MHz-1GHz)	±4.6 dB
Radiated Emission (1-18GHz)	±4.9 dB
Radiated Emission (18-40GHz)	±3.5 dB

## 7 Test Results

### 7.1 Radiated Emission below 960MHz

#### 7.1.1 Requirement

Per § 15.209

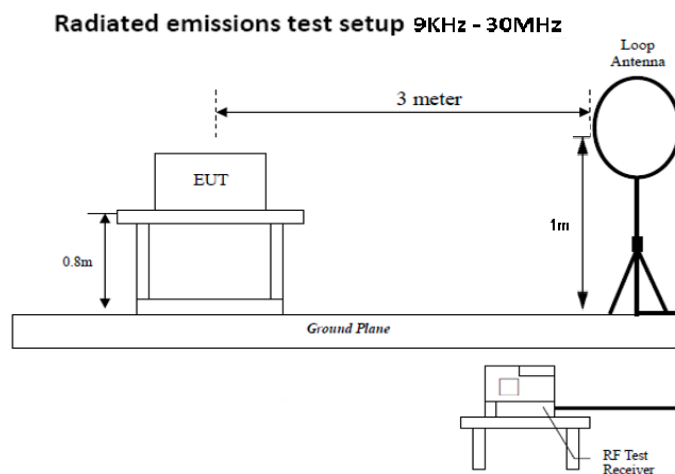
- (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency Range (MHZ)	Field Strength ( $\mu\text{V/m}$ )
0.009~0.490	2400/F(KHz)
0.490~1.705	24000/F(KHz)
1.705~30.0	30
30 – 88	100
88 – 216	150
216 – 960	200

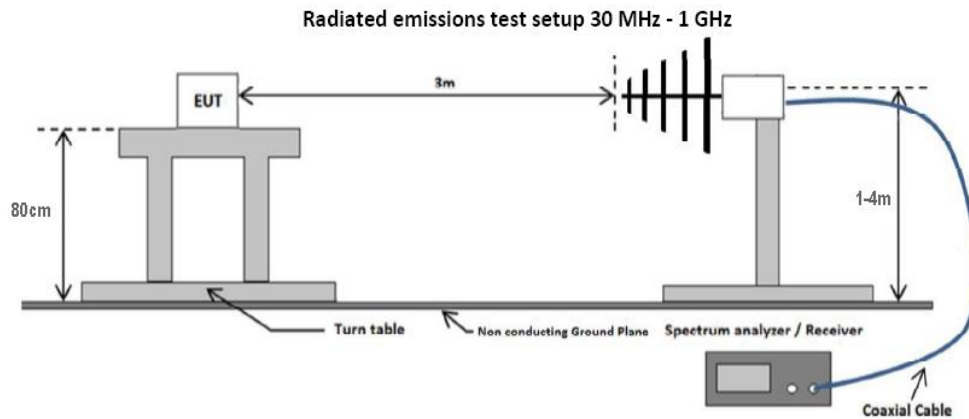
Per § 15.517

- (b) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209.

#### 7.1.2 Test setup







### 7.1.3 Test Procedure

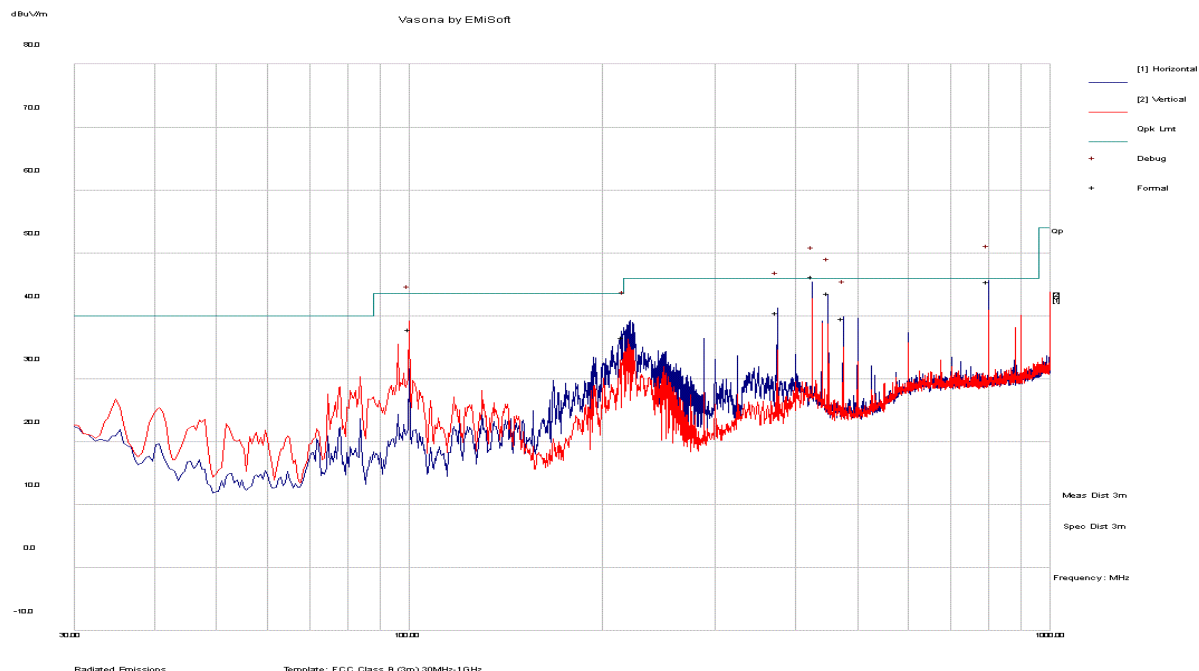
According to section 10.2 and section 6.5 in Radiated spurious emission measurements procedure below 960 MHz in ANSI C63.10-2013. Boresight antenna mast was used during the scanning to point to EUT to maximize the emission. The process will be repeated in 3 EUT orientations.

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
  - a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
  - b. The EUT was then rotated to the direction that gave the maximum emission.
  - c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 300 Hz for frequency below 150KHz.
4. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 10 kHz for frequency between 150KHz – 30MHz.
5. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-Peak detection at frequency between 30MHz - 1GHz.
6. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak and average measurement at frequency above 1GHz.
7. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.

## 7.1.4 Test Result

# RADIATED EMISSIONS BELOW 960 MHZ

Test Standard:	§ 15.209	Mode:	High CH – CH7
Frequency Range:	30 MHz – 960MHz	Test Date:	10/04/2021
Antenna Type/Polarity:	Bi-Log/Hor & Ver	Test Personnel:	Devin Tai
Remark:	With AC/DC adapter	Test Result:	Pass



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
425.02	46.60	6.30	-8.60	44.30	Quasi Max	H	199	210	46.00	-1.70	Pass
800.04	41.50	7.20	-4.20	44.50	Quasi Max	H	100	311	46.00	-1.50	Pass
450.02	46.70	6.20	-9.20	43.70	Quasi Max	H	206	229	46.00	-2.30	Pass
100.01	53.40	3.60	-19.10	37.90	Quasi Max	V	103	0	43.50	-5.60	Pass
375.01	43.80	6.20	-9.40	40.50	Quasi Max	H	100	227	46.00	-5.50	Pass
215.58	47.90	4.90	-16.20	36.60	Quasi Max	H	100	152	43.50	-6.90	Pass
425.02	46.60	6.30	-8.60	44.30	Quasi Max	H	199	210	46.00	-1.70	Pass

**Radiated Emission between 9KHz – 30MHz test result**

Note: no substantial emission is found other than the noise floor. Different modes have been verified.

## 7.2 Radiated Spurious Emissions above 960 MHz

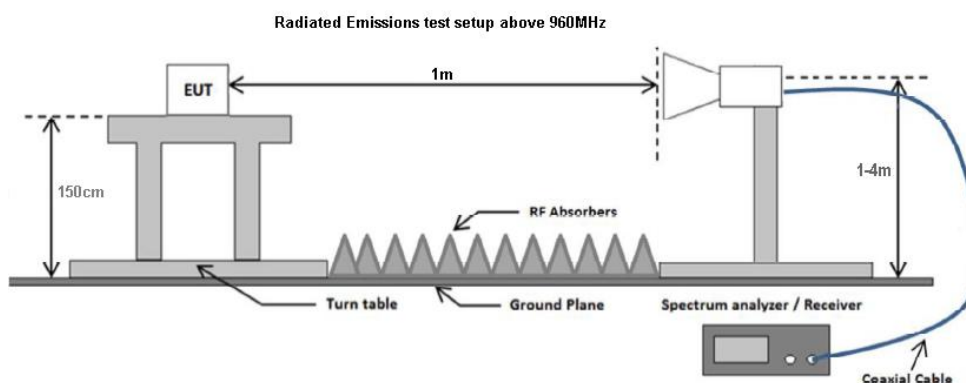
### 7.2.1 Requirement

§ 15.209, 15.517 (c), 15.521 (d)

The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency Range (MHZ)	EIRP in dBm	EIRP at 3 meter (dBuV/m)
960-1610	-75.3	19.9
1610-1990	-53.3	41.9
1990-3100	-51.3	43.9
3100-10600	-41.3	53.9
Above 10600	-51.3	43.9

### 7.2.2 Test Setup



### 7.2.3 Test Procedure

Setting:

Frequency Range: 960MHz to 40GHz

Measurement distance: 1m distance

Spectrum analyzer RBW: 1MHz

Spectrum analyser VBW: 10MHz

Detector Function: Peak for peak emission and RMS for average emission

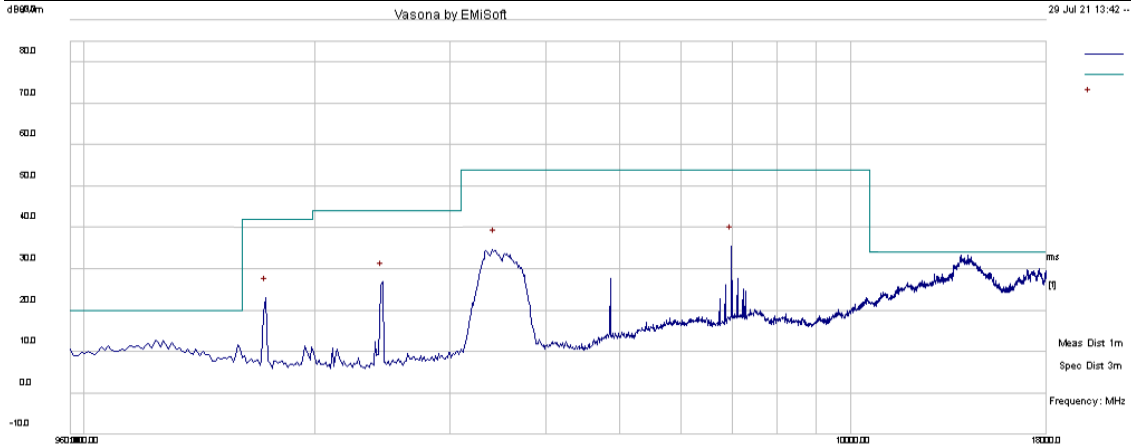
1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
  - a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
  - b. The EUT was then rotated to the direction that gave the maximum emission. All X, Y and Z axis are evaluated.
  - c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10MHz with Peak detection for Peak and average measurement at frequency above 1GHz.
4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.

Note: Actual measurement distance is 1-meter distance and the result is corrected to 3m distance to compare to the 3m distance EIRP limit.

## 7.2.4 Test Result

# RADIATED EMISSIONS ABOVE 960 MHZ

Test Standard:	FCC Part 15F	Mode:	CH1 - Horizontal
Frequency Range:	960MHz-18GHz	Test Date:	07/29/2021-08/02/2021
Antenna Type/Polarity:	Horn & Horizontal	Test Personnel:	Devin Tai
Remark:	N/A	Test Result:	Pass

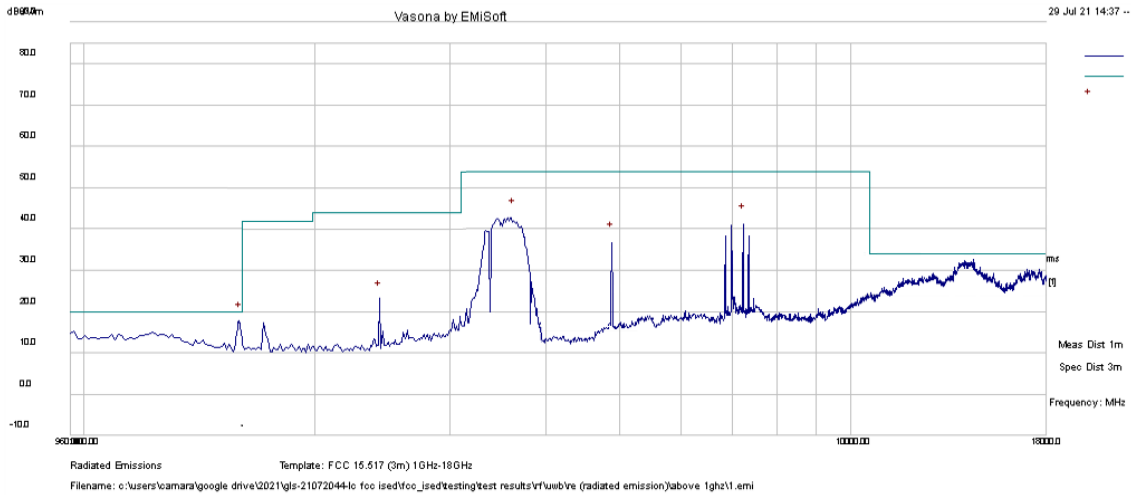


Radiated Emissions  
Template: FCC 15.107 (3m) 1GHz-18GHz  
Filename: c:\users\camara\google drive\2021\glis-21072044-lc-fcc-issd\test\test results\rf\unb\re (radiated emission)\above 1ghz\1.emi

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Limit dBuV/m	Margin dB	Pass/Fail
3440.831	41.67	5.83	-15.15	32.35	RMS	H	53.9	-21.55	Pass
2451.218	38.93	4.87	-18.89	24.91	RMS	H	43.9	-18.99	Pass
1726.979	36.46	4.45	-19.06	21.85	RMS	H	41.9	-20.05	Pass
6987.853	34.51	8.72	-8.75	34.48	RMS	H	53.9	-19.42	Pass

## RADIATED EMISSIONS ABOVE 960 MHZ

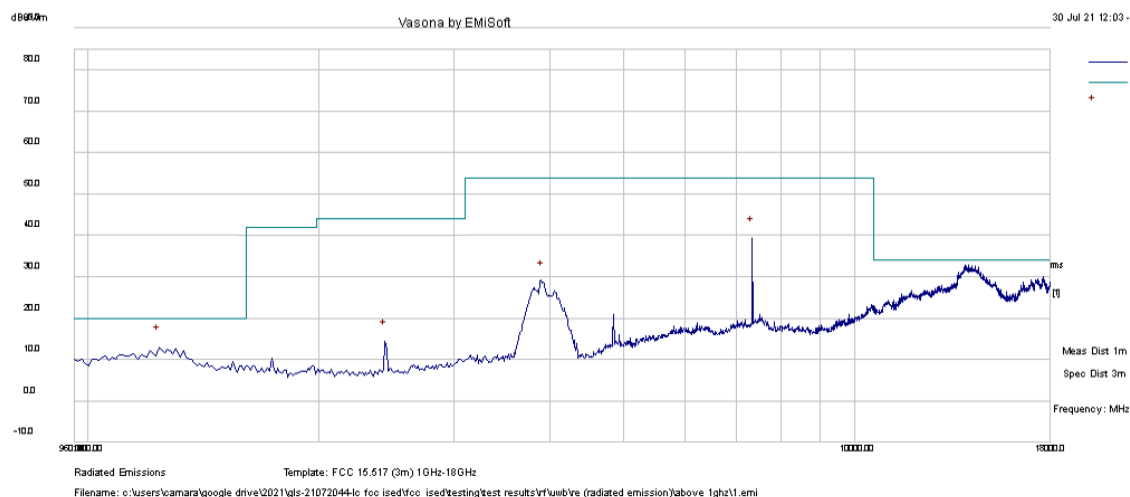
Test Standard:	FCC Part 15F	Mode:	CH1 - Vertical
Frequency Range:	960MHz-18GHz	Test Date:	07/29/2021-08/02/2021
Antenna Type/Polarity:	Horn & Ver	Test Personnel:	Devin Tai
Remark:	N/A	Test Result:	Pass



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Limit dBuV/m	Margin dB	Pass/Fail
3632.568	49.32	6.04	-14.45	40.91	RMS	V	53.9	-12.99	Pass
1599.176	30.14	4.45	-18.55	16.04	RMS	V	19.9	-3.86	Pass
7243.771	38.06	9.26	-8.33	38.99	RMS	V	53.9	-14.91	Pass
4877.727	39.85	6.89	-11.7	35.04	RMS	V	53.9	-18.86	Pass
2430.684	34.67	4.86	-18.92	20.61	RMS	V	43.9	-23.29	Pass

## RADIATED EMISSIONS ABOVE 960 MHZ

Test Standard:	FCC Part 15F	Mode:	CH2 - Horizontal
Frequency Range:	960MHz-18GHz	Test Date:	07/29/2021-08/02/2021
Antenna Type/Polarity:	Horn & Horizontal	Test Personnel:	Devin Tai
Remark:	N/A	Test Result:	Pass

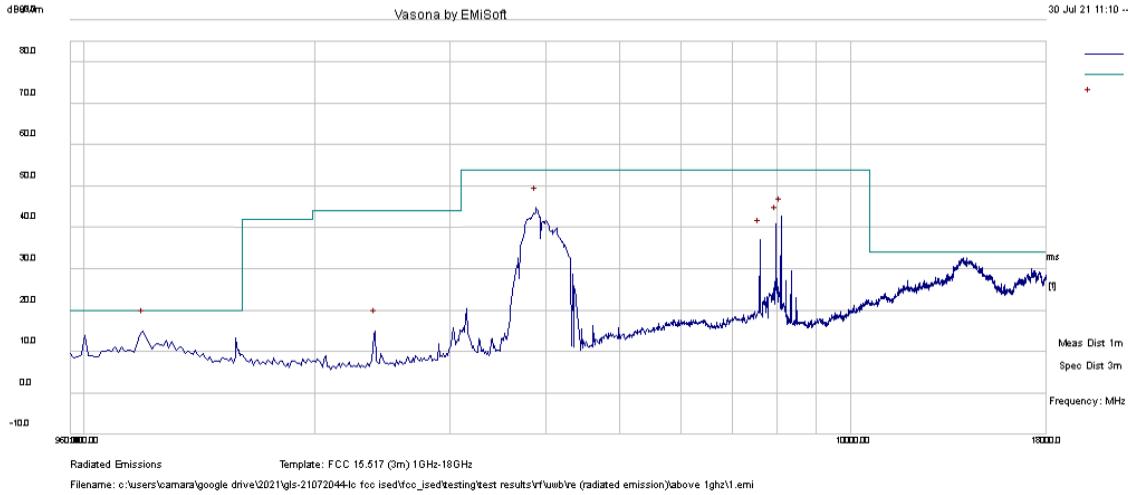


Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Limit dBuV/m	Margin dB	Pass/Fail
3915.125	34.1	6.33	-13.17	27.26	RMS	H	53.9	-26.64	Pass
7350.072	36.78	9.48	-8.35	37.91	RMS	H	53.9	-15.99	Pass
1237.484	23.23	4.02	-15.14	12.11	RMS	H	19.9	-7.79	Pass
2441.156	27.42	4.87	-18.91	13.38	RMS	H	43.9	-30.52	Pass



## RADIATED EMISSIONS ABOVE 960 MHZ

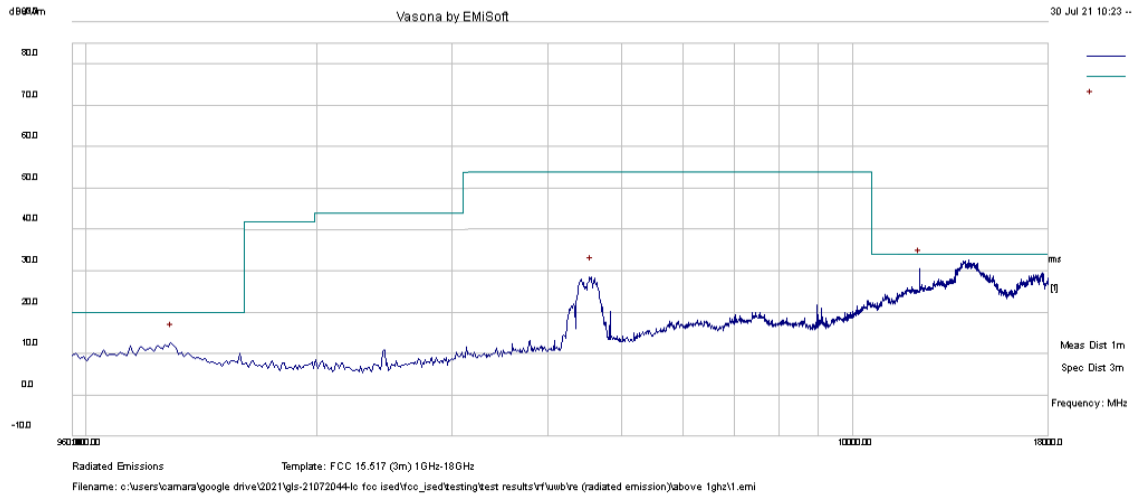
Test Standard:	FCC Part 15F	Mode:	CH2 - Vertical
Frequency Range:	960MHz-18GHz	Test Date:	07/29/2021-08/02/2021
Antenna Type/Polarity:	Horn & Ver	Test Personnel:	Devin Tai
Remark:	N/A	Test Result:	Pass



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Limit dBuV/m	Margin dB	Pass/Fail
3894.294	49.83	6.31	-13.17	42.97	RMS	V	53.9	-10.93	Pass
7989.624	38.27	9.78	-9.28	38.77	RMS	V	53.9	-15.13	Pass
8117.173	40.08	9.8	-9.19	40.69	RMS	V	53.9	-13.21	Pass
1194.519	24.42	3.94	-14.76	13.6	RMS	V	19.9	-6.3	Pass
7616.347	34.21	9.79	-9.05	34.95	RMS	V	53.9	-18.95	Pass
2397.966	28.9	4.83	-18.97	14.76	RMS	V	43.9	-29.14	Pass

## RADIATED EMISSIONS ABOVE 960 MHZ

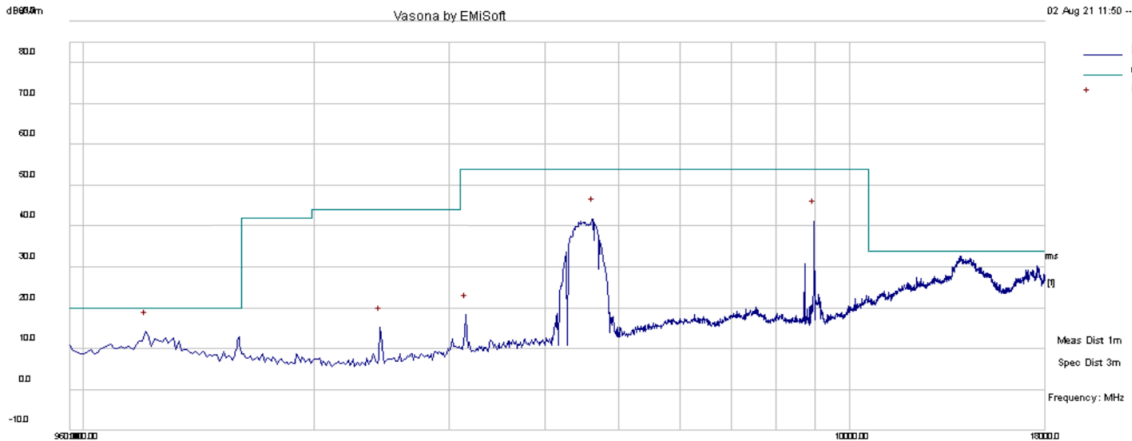
Test Standard:	FCC Part 15F	Mode:	CH3 - Horizontal
Frequency Range:	960MHz-18GHz	Test Date:	07/29/2021-08/02/2021
Antenna Type/Polarity:	Horn & Horizontal	Test Personnel:	Devin Tai
Remark:	N/A	Test Result:	Pass



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Limit dBuV/m	Margin dB	Pass/Fail
1294.546	22.14	4.12	-15.63	10.63	RMS	H	19.9	-9.27	Pass
4571.56	33.55	6.81	-12.67	27.69	RMS	H	53.9	-26.21	Pass
12228.81	21.57	13.38	-5.67	29.28	RMS	H	33.9	-4.62	Pass

## RADIATED EMISSIONS ABOVE 960 MHZ

Test Standard:	FCC Part 15F	Mode:	CH3 - Vertical
Frequency Range:	960MHz-18GHz	Test Date:	07/29/2021-08/02/2021
Antenna Type/Polarity:	Horn & Ver	Test Personnel:	Devin Tai
Remark:	N/A	Test Result:	Pass

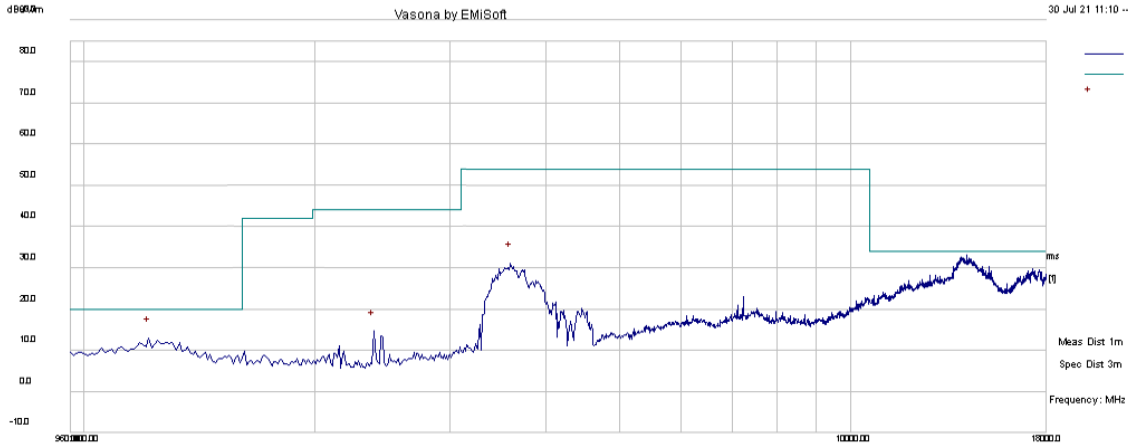


Radiated Emissions Template: FCC 15.117 (3m) 1GHz-18GHz  
Filename: c:\users\camara\google drive\2021\gl-21072044-to fcc used\used\testing\test results\rf\umbve (radiated emission)\above 1ghz\1.emi

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Limit dBuV/m	Margin dB	Pass/Fail
1205.22	23.53	3.96	-14.83	12.66	RMS	V	19.9	-7.24	Pass
2441.054	28.32	4.87	-18.91	14.28	RMS	V	43.9	-29.62	Pass
3154.395	27.5	5.54	-16.08	16.96	RMS	V	53.9	-36.94	Pass
4623.498	45.89	6.83	-12.43	40.29	RMS	V	53.9	-13.61	Pass
8990.017	38.93	9.95	-9.2	39.68	RMS	V	53.9	-14.22	Pass

## RADIATED EMISSIONS ABOVE 960 MHZ

Test Standard:	FCC Part 15F	Mode:	CH4 - Horizontal
Frequency Range:	960MHz-18GHz	Test Date:	07/29/2021-08/02/2021
Antenna Type/Polarity:	Horn & Horizontal	Test Personnel:	Devin Tai
Remark:	N/A	Test Result:	Pass

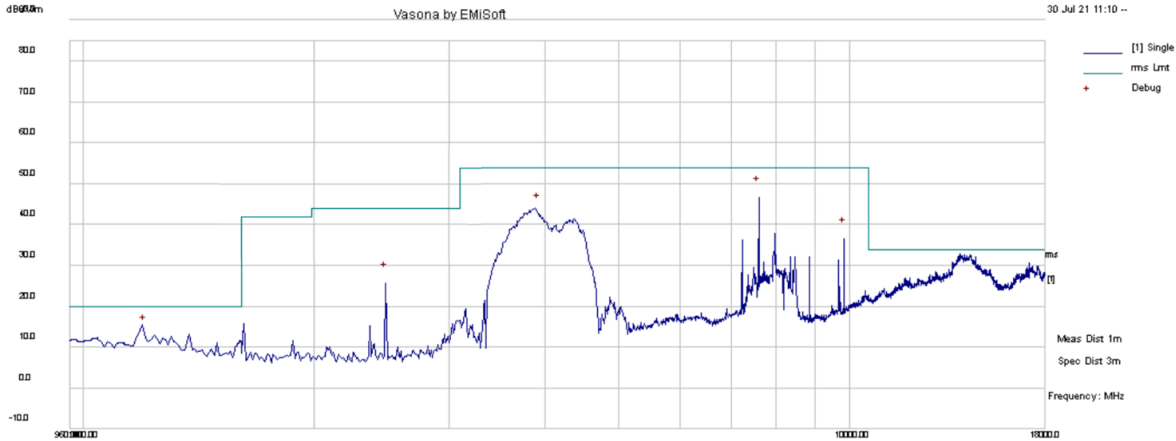


Radiated Emissions Template: FCC 15.17 (3m) 10Hz-180Hz  
Filename: c:\users\camara\google drive\2021\gl-21072044-fo-ised\fo-ised\testing\test results\rf\unb\ve (radiated emission)\above 1ghz\1.emi

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Limit dBuV/m	Margin dB	Pass/Fail
3603.268	38.24	6.01	-14.48	29.77	RMS	H	53.9	-24.13	Pass
2387.842	27.18	4.82	-18.99	13.01	RMS	H	43.9	-30.89	Pass
1216.015	22.23	3.98	-14.93	11.28	RMS	H	19.9	-8.62	Pass

## RADIATED EMISSIONS ABOVE 960 MHZ

Test Standard:	FCC Part 15F	Mode:	CH4 - Vertical
Frequency Range:	960MHz-18GHz	Test Date:	07/29/2021-08/02/2021
Antenna Type/Polarity:	Horn & Ver	Test Personnel:	Devin Tai
Remark:	N/A	Test Result:	Pass

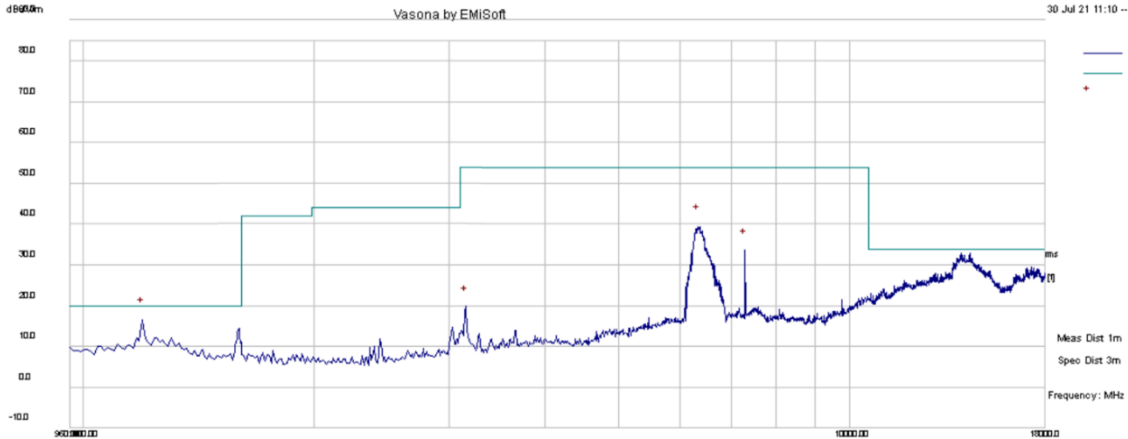


Radiated Emissions Template: FCC 15.117 (3m) 1GHz-18GHz  
Filename: c:\users\camara\google drive\2021\glis-21072044-lc-fcc-ised\fooset\testing\test results\rf\umb\ve (radiated emission)\above 1ghz\1.emi

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Limit dBuV/m	Margin dB	Pass/Fail
3925.982	48.11	6.34	-13.18	41.27	RMS	V	53.9	-12.63	Pass
7616.28	43.59	9.79	-9.05	44.33	RMS	V	53.9	-9.57	Pass
2483.075	37.84	4.9	-18.69	24.05	RMS	V	43.9	-19.85	Pass
1204.838	22.12	3.96	-14.82	11.26	RMS	V	19.9	-8.64	Pass
9831.445	33.08	11.07	-8.72	35.43	RMS	V	53.9	-18.47	Pass

## RADIATED EMISSIONS ABOVE 960 MHZ

Test Standard:	FCC Part 15F	Mode:	CH5 - Horizontal
Frequency Range:	960MHz-18GHz	Test Date:	07/29/2021-08/02/2021
Antenna Type/Polarity:	Horn & Horizontal	Test Personnel:	Devin Tai
Remark:	N/A	Test Result:	Pass

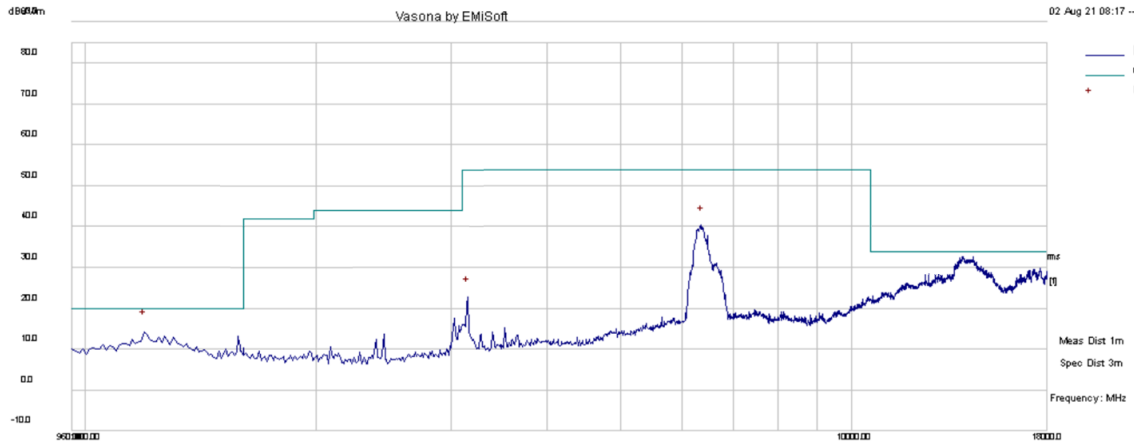


Radiated Emissions Template: FCC 15.117 (3m) 1GHz-18GHz  
Filename: c:\users\camara\google drive\2021\gl-21072044-to fcc\used\testing\test results\rf\unb\ve (radiated emission)\above 1ghz\1.emi

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Limit dBuV/m	Margin dB	Pass/Fail
6339.526	38.91	7.87	-9.02	37.76	RMS	H	53.9	-16.14	Pass
7307.478	31.29	9.4	-8.35	32.34	RMS	H	53.9	-21.56	Pass
3154.66	28.24	5.54	-16.08	17.7	RMS	H	53.9	-36.2	Pass
1194.481	26.35	3.94	-14.76	15.53	RMS	H	19.9	-4.37	Pass

## RADIATED EMISSIONS ABOVE 960 MHZ

Test Standard:	FCC Part 15F	Mode:	CH5 - Vertical
Frequency Range:	960MHz-18GHz	Test Date:	07/29/2021-08/02/2021
Antenna Type/Polarity:	Horn & Ver	Test Personnel:	Devin Tai
Remark:	N/A	Test Result:	Pass

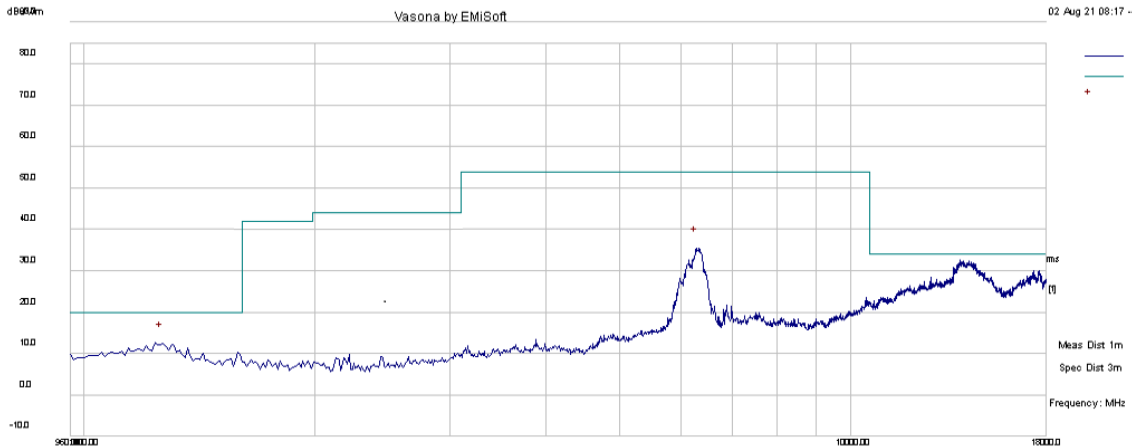


Radiated Emissions  
Template: FCC 15.117 (3m) 1GHz-18GHz  
Filename: c:\users\camara\google drive\2021\gl-21072044-to fcc used\used\testing\test results\rf\umbve (radiated emission)\above 1ghz\1.emi

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Limit dBuV/m	Margin dB	Pass/Fail
1195.096	24.31	3.95	-14.76	13.5	RMS	V	19.9	-6.4	Pass
3154.74	31.15	5.54	-16.08	20.61	RMS	V	53.9	-33.29	Pass
6377.2	38.92	7.87	-9.08	37.71	RMS	V	53.9	-16.19	Pass

## RADIATED EMISSIONS ABOVE 960 MHZ

Test Standard:	FCC Part 15F	Mode:	CH7 - Horizontal
Frequency Range:	960MHz-18GHz	Test Date:	07/29/2021-08/02/2021
Antenna Type/Polarity:	Horn & Horizontal	Test Personnel:	Devin Tai
Remark:	N/A	Test Result:	Pass



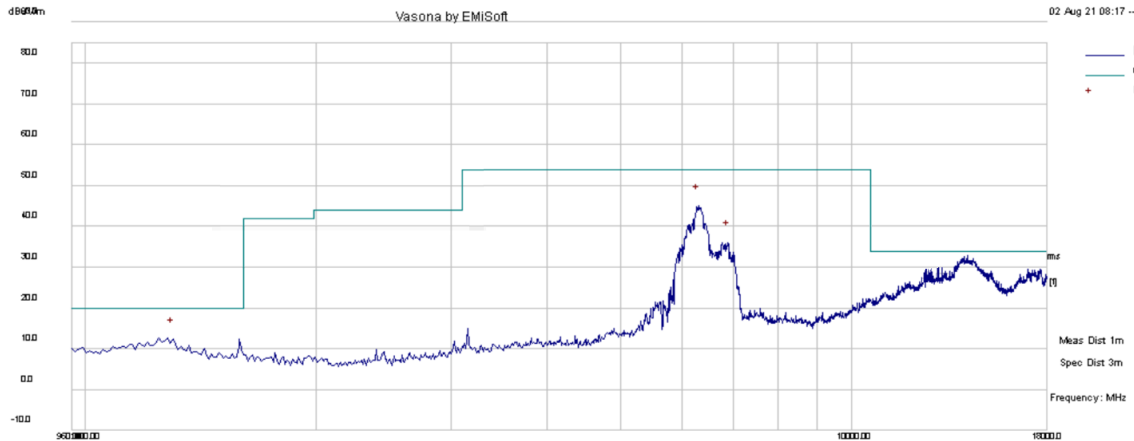
Radiated Emissions  
Template: FCC 15.517 (3m) 10Hz-18GHz  
Filename: c:\users\camara\google drive\2021\glis-21072044-lc-fcc-ised\fcc\_ised\testing\test results\rf\unb\ve (radiated emission)\above 1ghz\1.emi

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Limit dBuV/m	Margin dB	Pass/Fail
1258.995	21.39	4.06	-15.33	10.12	RMS	H	19.9	-9.78	Pass
6287.915	35.56	7.87	-8.85	34.58	RMS	H	53.9	-19.32	Pass



## RADIATED EMISSIONS ABOVE 960 MHZ

Test Standard:	FCC Part 15F	Mode:	CH7 - Vertical
Frequency Range:	960MHz-18GHz	Test Date:	07/29/2021-08/02/2021
Antenna Type/Polarity:	Horn & Ver	Test Personnel:	Devin Tai
Remark:	N/A	Test Result:	Pass



Radiated Emissions Template: FCC 15.117 (3m) 1GHz-18GHz  
Filename: c:\users\camara\google drive\2021\glr-21072044-to fcc used\test\test results\rf\umbve (radiated emission)\above 1ghz\1.emi

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Limit dBuV/m	Margin dB	Pass/Fail
1298.346	22.39	4.13	-15.67	10.85	RMS	V	19.9	-9.05	Pass
6307.39	44.2	7.87	-8.9	43.17	RMS	V	53.9	-10.73	Pass
6902.673	35.25	8.57	-8.76	35.06	RMS	V	53.9	-18.84	Pass

**Radiated Emission between 18GHz – 40GHz test result**

Note: no substantial emission is found other than the noise floor. Different modes have been verified.

## 7.3 Peak Emissions in a 50 MHz Bandwidth

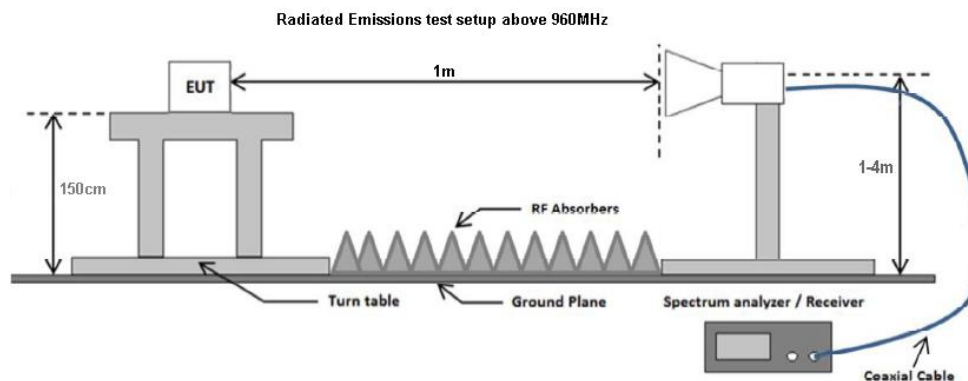
### 7.3.1 Requirement

§ 15.517 (e), 15.521 (g)

There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, fM. That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521.

Per 15.521 (g), when a peak measurement is required, it is acceptable to use a resolution bandwidth other than the 50 MHz specified in this subpart. This resolution bandwidth shall not be lower than 1 MHz or greater than 50 MHz, and the measurement shall be centered on the frequency at which the highest radiated emission occurs, fM. If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be  $20 \log (RBW/50)$  dBm where RBW is the resolution bandwidth in megahertz that is employed. This may be converted to a peak field strength level at 3 meters using  $E(dBuV/m) = P(dBm \text{ EIRP}) + 95.2$ . If RBW is greater than 3 MHz, the application for certification filed with the Commission must contain a detailed description of the test procedure, calibration of the test setup, and the instrumentation employed in the testing.

### 7.3.2 Test Setup



### 7.3.3 Test Procedure

Setting:

Frequency Range: EUT operating frequencies

Measurement distance: 1m distance

Spectrum analyzer RBW: 10MHz

Spectrum analyser VBW: 50MHz

Detector Function: Peak for peak emission

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
  - a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
  - b. The EUT was then rotated to the direction that gave the maximum emission. All X, Y and Z axis are evaluated.
  - c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. The resolution bandwidth of test receiver/spectrum analyzer is 10MHz and video bandwidth is 50MHz with Peak detection for Peak and average measurement at frequency above 1GHz.
4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.

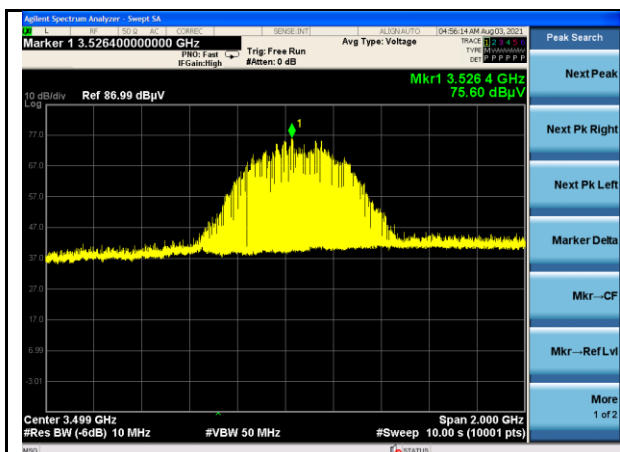
Note: Actual measurement distance is 1-meter distance and the result is converted to 3m distance to compare to the 3m distance EIRP limit.

### 7.3.4 Test Result

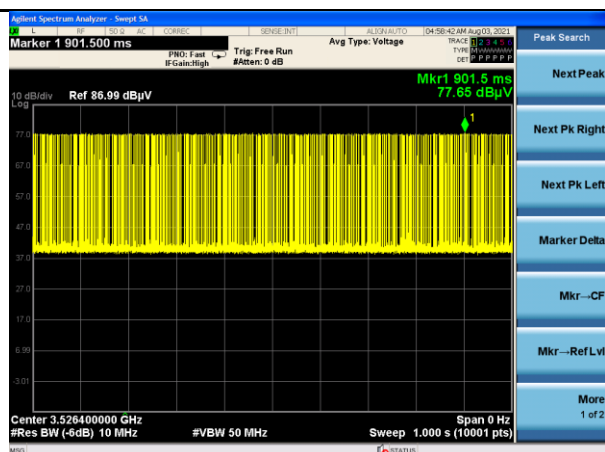
CH	Fm(MHz)	Field Strength (dBuV/m @ 3m)	Peak Power (dBm/10MHz)	Peak Power (dBm/50MHz)	Limit (dBm/50MHz)	Result
1	3499	77.65	-17.55	-3.57	0	Pass
2	3994	78.26	-16.94	-2.96	0	Pass
3	4493	78.05	-17.15	-3.17	0	Pass
4	3994	78.28	-16.92	-2.94	0	Pass
5	6489	74.86	-20.34	-6.36	0	Pass
7	6489	77.31	-17.89	-3.91	0	Pass

**Note:** Field Strength E(dBuV/m) = P (dBm EIRP) + 95.2

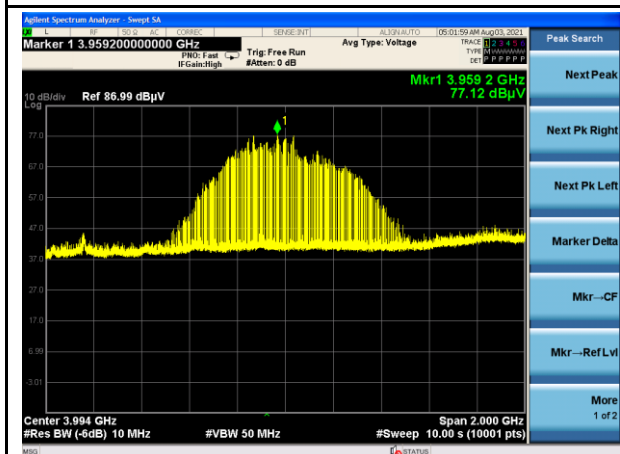
Peak Power(dBm/50MHz) = Peak Power (dBm/10MHz) – 20\*log (10/50)



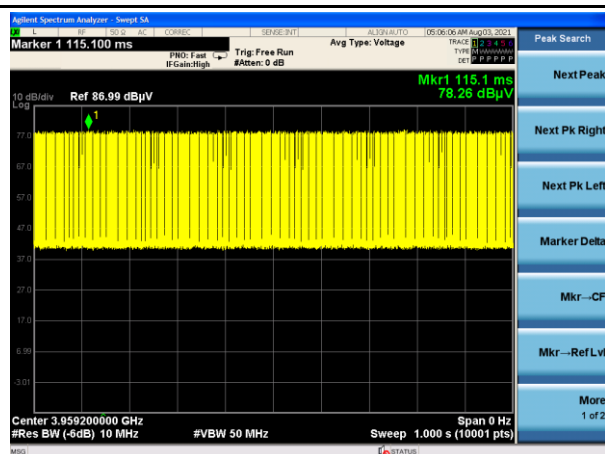
Peak Power Emission (CH1) – Peak search



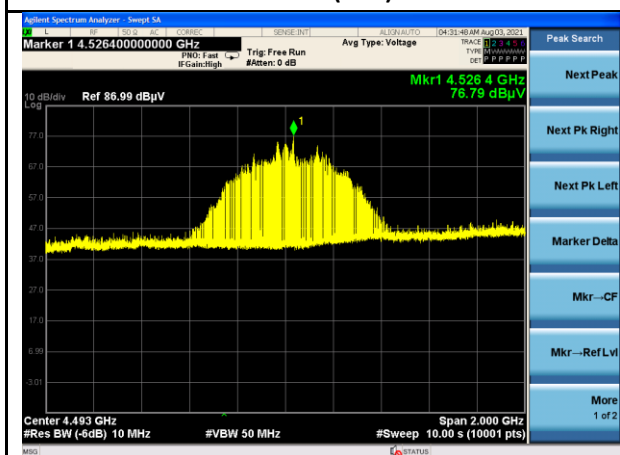
Peak Power Emission (CH1) – Zoom



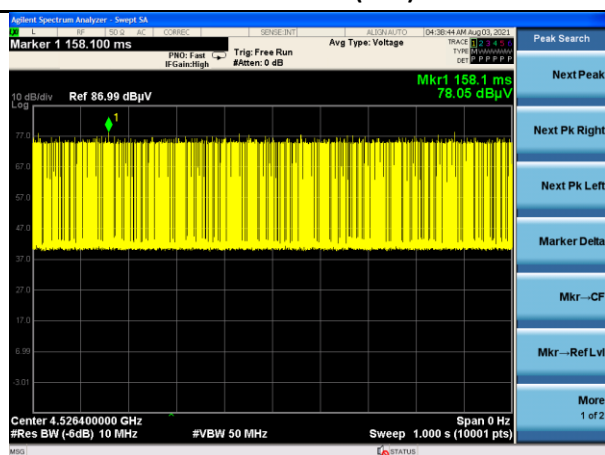
Peak Power Emission (CH2) – Peak search



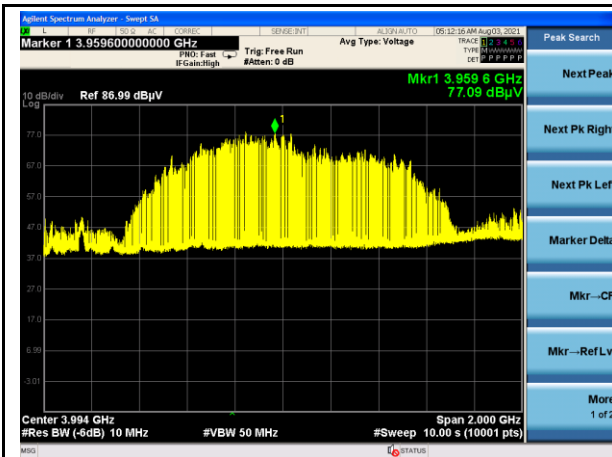
Peak Power Emission (CH2) – Zoom



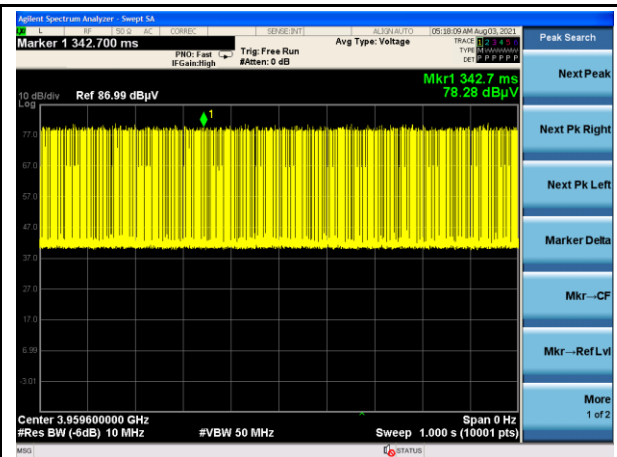
Peak Power Emission (CH3) – Peak search



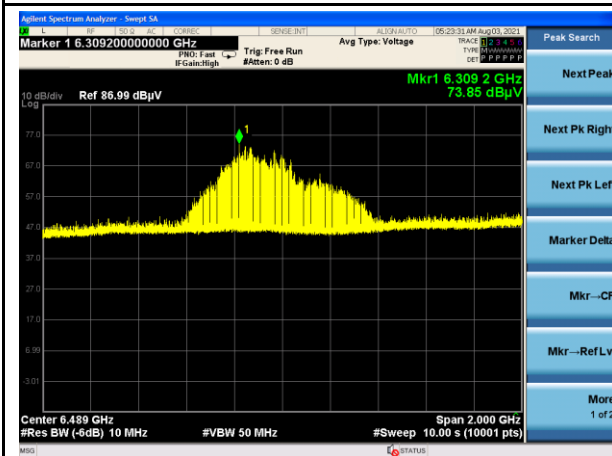
Peak Power Emission (CH3) – Zoom



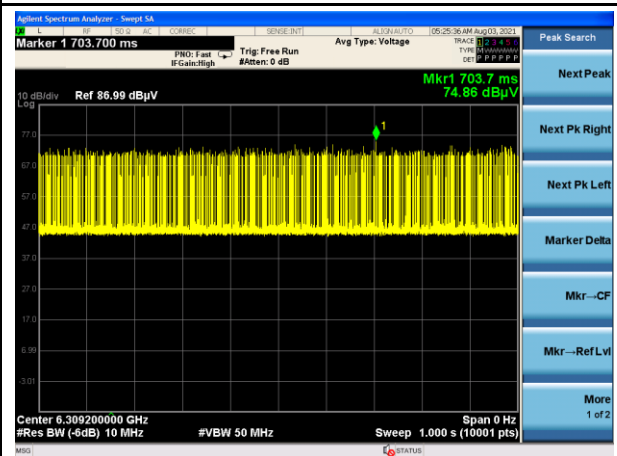
Peak Power Emission (CH4) – Peak search



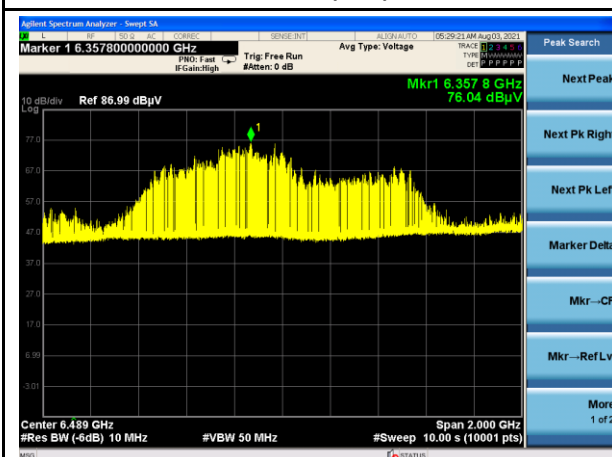
Peak Power Emission (CH4) – Zoom



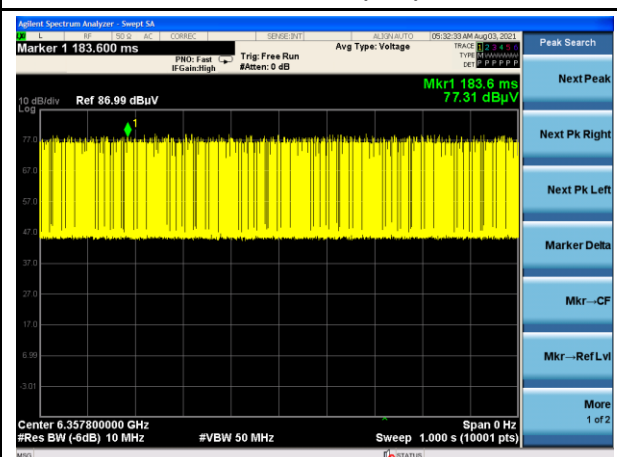
Peak Power Emission (CH5) – Peak search



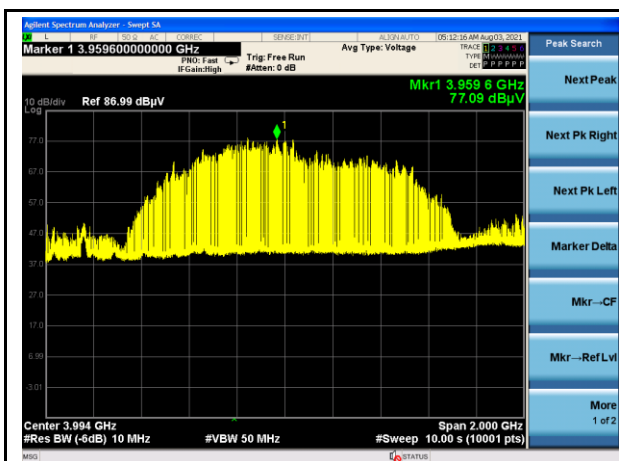
Peak Power Emission (CH5) – Zoom



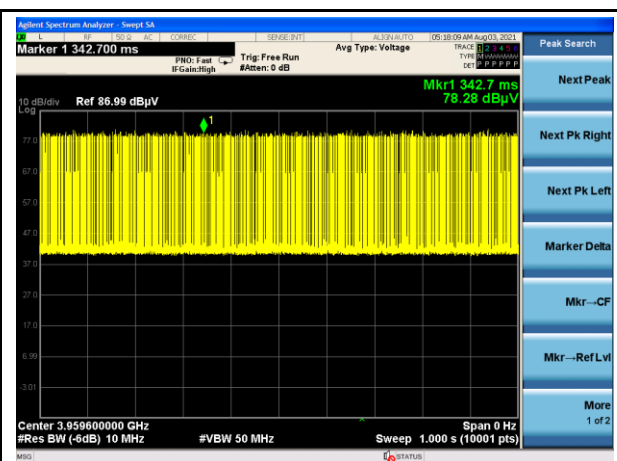
Peak Power Emission (CH7) – Peak search



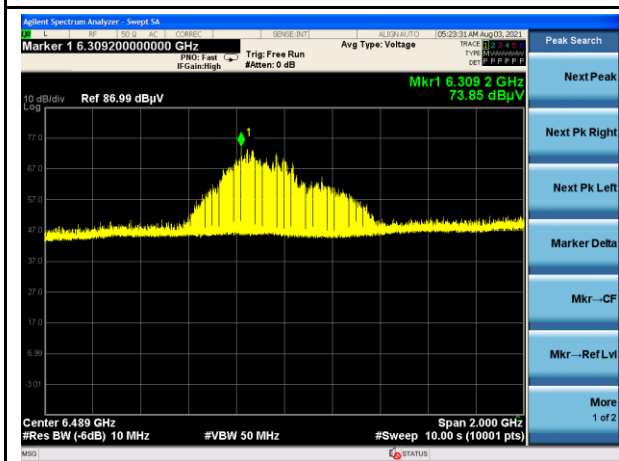
Peak Power Emission (CH7) – Zoom



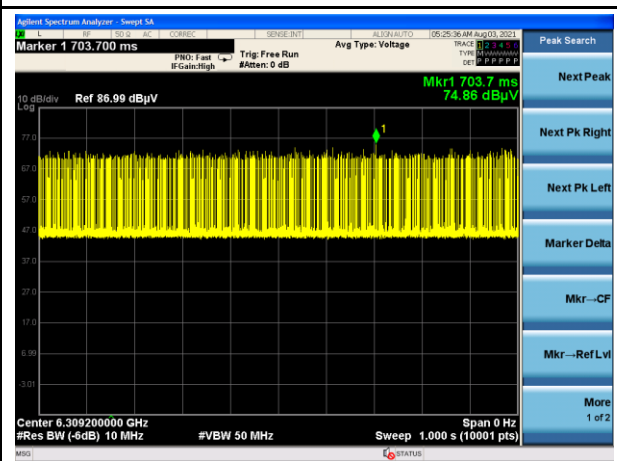
Peak Power Emission (CH4) – Peak search



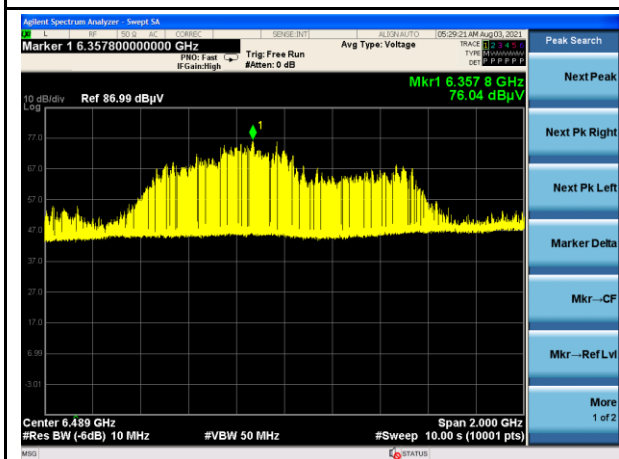
Peak Power Emission (CH4) – Zoom



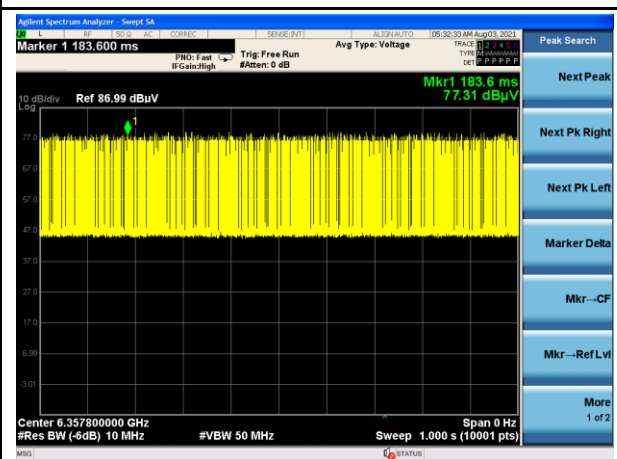
Peak Power Emission (CH5) – Peak search



Peak Power Emission (CH5) – Zoom



Peak Power Emission (CH7) – Peak search



Peak Power Emission (CH7) – Zoom



## 7.4 Conducted Emissions

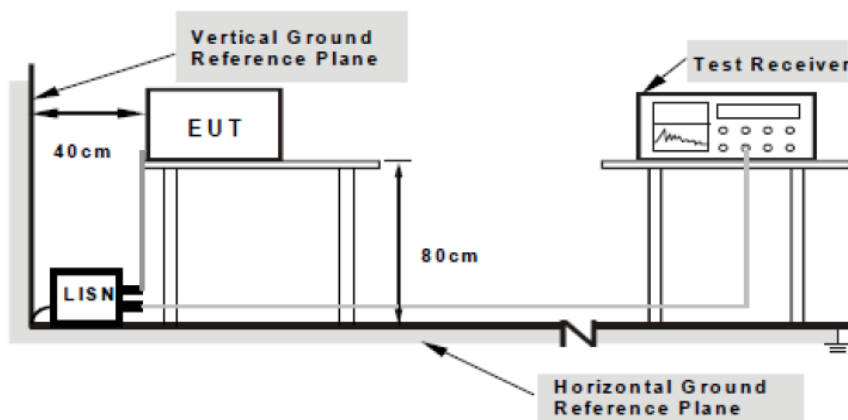
### 7.4.1 Requirement

Per § 15.107 (a), ICES-003, except for Class A digital device, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms' line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Section	Frequency ranges (MHz)	Limit (dBuV)	
		QP	Average
Class B devices	0.15 – 0.5	66 – 56	56 – 46
	0.5 – 5	56	46
	5 – 30	60	50

NOTE 1 The lower limit shall apply at the transition frequencies.

### 7.4.2 Test Setup



Note: 1. Support units were connected to second LISN.  
2. Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.

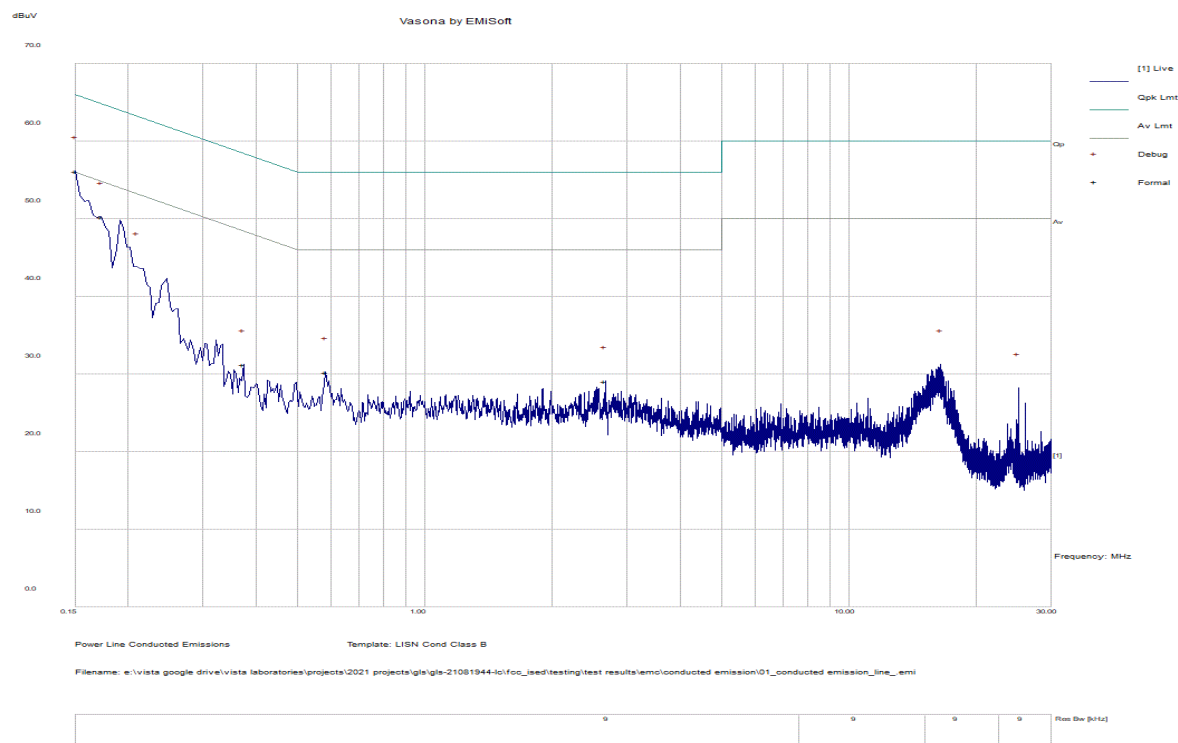
### **7.4.3 Test Procedure**

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
2. The power supply for the EUT was fed through a 50 $\Omega$ /50 $\mu$ H EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
4. All other supporting equipment was powered separately from another main supply.
5. The EUT was switched on and allowed to warm up to its normal operating condition.
6. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.
7. High peaks, relative to the limit line, were then selected.
8. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz. For FCC tests, only Quasi-peak measurements were made; while for CISPR/EN tests, both Quasi-peak and Average measurements were made
9. All possible modes of operation were investigated. Only the worst case emissions were measured and reported. All other emissions were relatively insignificant.

## 7.4.4 Test Result

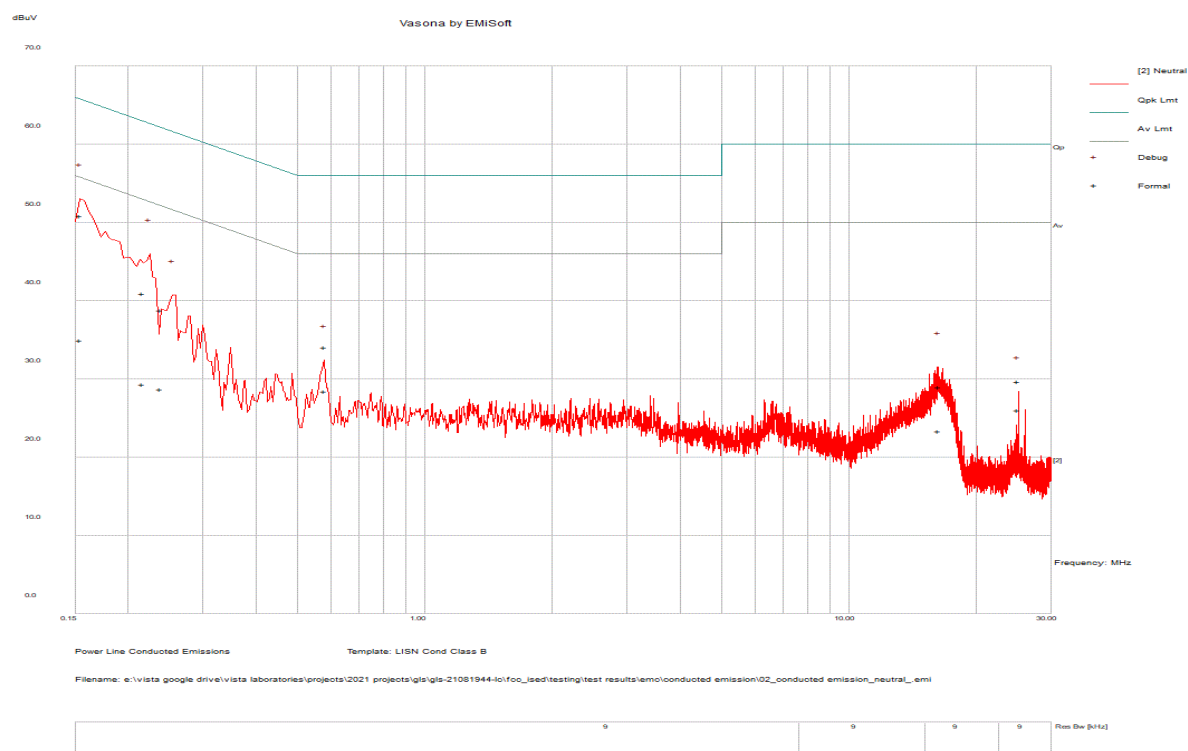
# CONDUCTED EMISSIONS

Test Standard:	47CFR 15.207	Mode:	Conducted Emission
Frequency Range:	0.15 - 30MHz	Test Date:	10/04/2021
Line:	Live	Test Personnel:	Devin Tai
Remark:	With AC/DC adapter	Test Result:	Pass



Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass/Fail
0.150	38.40	10.10	0.20	48.70	Quasi Peak	Live	66.00	-17.20	Pass
0.154	41.40	10.10	0.20	51.70	Quasi Peak	Live	65.80	-14.00	Pass
0.580	22.80	10.10	0.10	33.00	Quasi Peak	Live	56.00	-23.00	Pass
2.669	22.40	10.30	0.10	32.80	Quasi Peak	Live	56.00	-23.20	Pass
0.381	22.60	10.10	0.10	32.80	Quasi Peak	Live	58.30	-25.50	Pass
0.150	22.10	10.10	0.20	32.40	Average	Live	56.00	-23.60	Pass
0.154	24.70	10.10	0.20	35.00	Average	Live	55.80	-20.80	Pass
0.580	17.00	10.10	0.10	27.30	Average	Live	46.00	-18.70	Pass
2.669	16.50	10.30	0.10	26.90	Average	Live	46.00	-19.10	Pass
0.381	16.80	10.10	0.10	27.00	Average	Live	48.30	-21.30	Pass

Test Standard:	47CFR 15.207	Mode:	Conducted Emission
Frequency Range:	0.15 - 30MHz	Test Date:	10/04/2021
Line:	Neutral	Test Personnel:	Devin Tai
Remark:	With AC/DC adapter	Test Result:	Pass



Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass/Fail
0.154	40.60	10.10	0.20	50.90	Quasi Peak	Neutral	65.80	-14.90	Pass
0.216	30.80	10.10	0.20	41.10	Quasi Peak	Neutral	63.00	-21.90	Pass
0.238	28.60	10.10	0.20	38.90	Quasi Peak	Neutral	62.20	-23.30	Pass
0.580	23.90	10.10	0.10	34.10	Quasi Peak	Neutral	56.00	-21.90	Pass
16.278	18.00	10.70	0.30	29.00	Quasi Peak	Neutral	60.00	-31.00	Pass
25.071	18.20	10.80	0.70	29.80	Quasi Peak	Neutral	60.00	-30.20	Pass
0.154	24.70	10.10	0.20	35.00	Average	Neutral	55.80	-20.80	Pass
0.216	19.20	10.10	0.20	29.40	Average	Neutral	53.00	-23.60	Pass
0.238	18.60	10.10	0.20	28.80	Average	Neutral	52.20	-23.40	Pass
0.580	18.30	10.10	0.10	28.50	Average	Neutral	46.00	-17.50	Pass
16.278	12.40	10.70	0.30	23.40	Average	Neutral	50.00	-26.60	Pass
25.071	14.50	10.80	0.70	26.10	Average	Neutral	50.00	-23.90	Pass

## 8 EUT and Test Setup Photos

See FCC exhibits

## 9 Test Instrument List

Equipment	Manufacturer	Model	Instrument Number	Cal. Date	Cal. Due
Semi-Anechoic Chamber	ETS-Lindgren	10M	VL001	10/18/2020	10/18/2021
Shielding Control Room	ETS-Lindgren	Series 81	VL006	N/A	N/A
Spectrum Analyzer	Keysight	N9020A	MY50110074	06/17/2021	06/17/2022
Spectrum Analyser (9kHz-40GHz)	R&S	FSP38	100630	06/15/2021	06/15/2022
EMC Test Receiver	R&S	ESL6	100230	06/14/2021	06/14/2022
LISN (9KHz - 30MHz)	EMCO	3816/2	9705-1066	05/04/2021	05/04/2022
Bi-Log Antenna	ETS-Lindgren	3142E	217921	11/15/2020	11/15/2021
Horn Antenna (1-18GHz)	Electro-Metrics	EM-6961	6292	05/14/2021	05/14/2022
Horn Antenna (18-40GHz)	Com-Power	AH-840	101109	06/24/2021	06/24/2022
Preamplifier	RF Bay, Inc.	LPA-10-20	11180621	07/15/2021	07/15/2022
True RMS Multi-meter	UNI-T	UT181A	C173014829	05/05/2021	05/05/2022
Temp / Humidity / Pressure Meter	PCE Instruments	PCE-THB 40	R062028	05/15/2021	05/15/2022
RF Attenuator	Pasternack	PE7005-3	VL061	07/16/2021	07/16/2022
Preamplifier 100KHz - 40GHz	Aeroflex	33711-392-77150-11	064	07/16/2021	07/16/2022
EM Center Control	ETS-Lindgren	7006-001	160136	N/A	N/A
Turn Table	ETS-Lindgren	2181-3.03	VL002	N/A	N/A
Boresight Antenna Tower	ETS-Lindgren	2171B	VL003	N/A	N/A
Loop Antenna (9k-30MHz)	Com-Power	AL-130	121012	05/16/2021	05/16/2122
RE test cable(below 6GHz)	Vista	RE-6GHz-01	RE-6GHz-01	07/16/2021	07/16/2022
RE test cable (1-18GHz)	PhaseTrack	II-240	RE-18GHz-01	07/16/2021	07/16/2022
RE test cable (>18GHz)	Sucoflex	104	344903/4	07/16/2021	07/16/2022
Pulse limiter	Com-Power	LIT-930A	531727	07/16/2021	07/16/2022
CE test cable #1	FIRST RF	FRF-C-1002-001	CE-6GHz-01	07/16/2021	07/16/2022
CE test cable#2	FIRST RF	FRF-C-1002-001	CE-6GHz-02	07/16/2021	07/16/2022